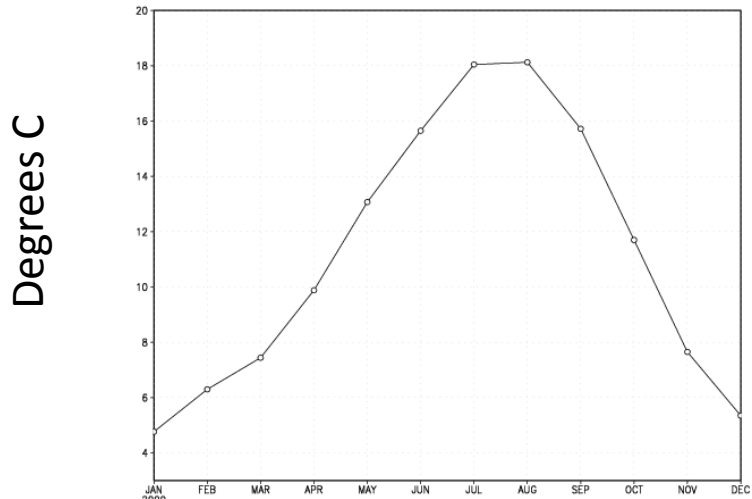


Homework #2 Key
ATMO 529, Fall 2013

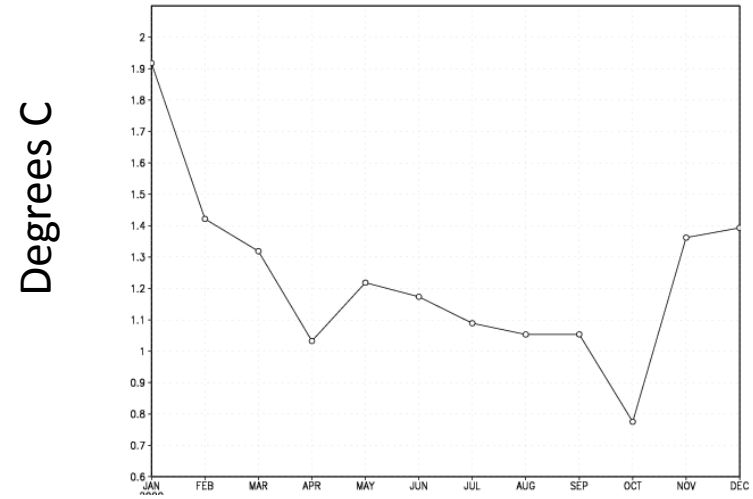
Part 1: Computing statistical moments
of the distributions
20 points

Station #1: Seattle, WA (Temperature)

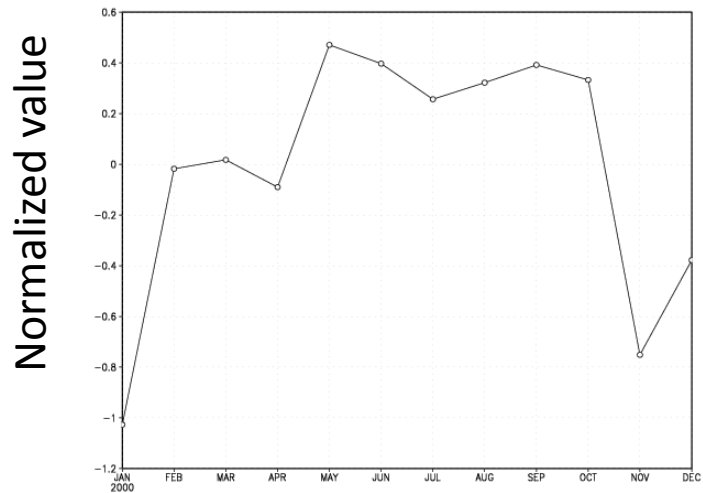
Mean



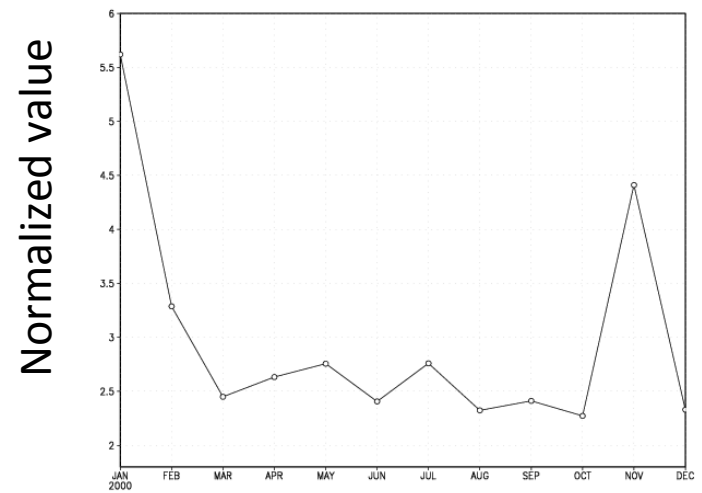
Standard deviation



Skewness (normalized)

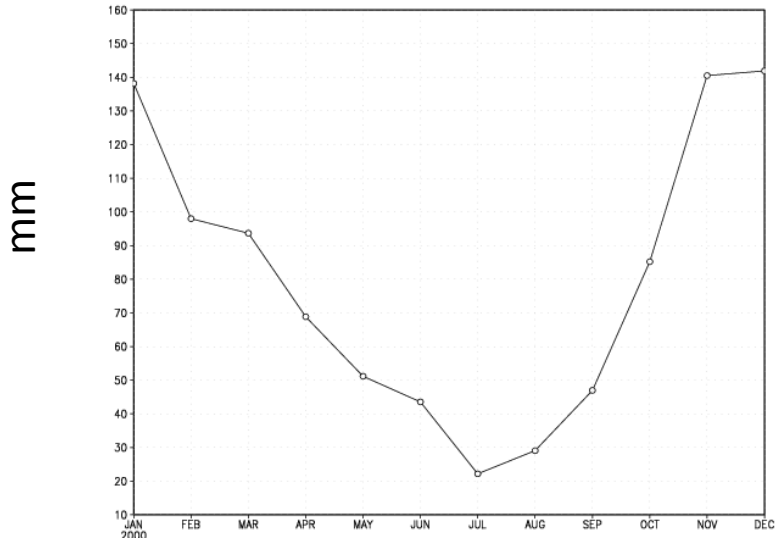


Kurtosis (normalized)

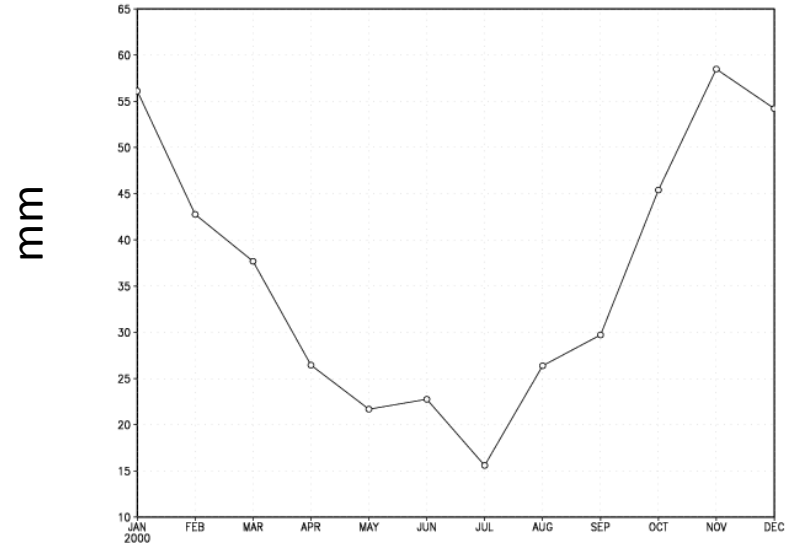


Station #1: Seattle, WA (Precipitation)

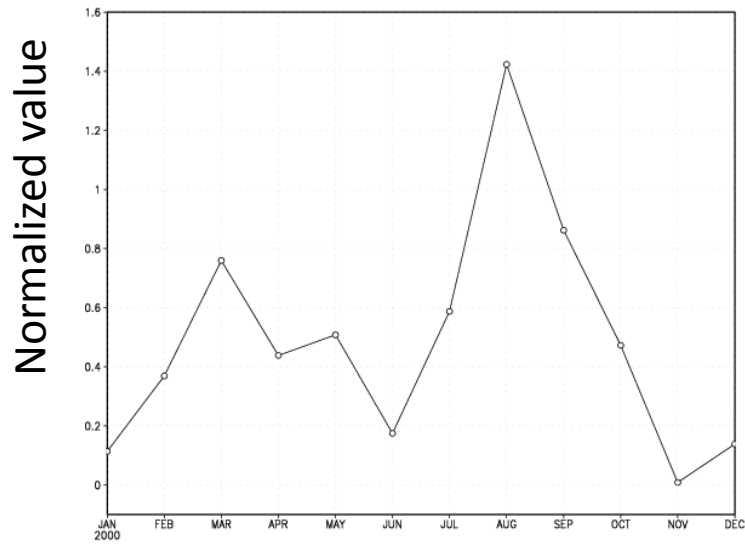
Mean



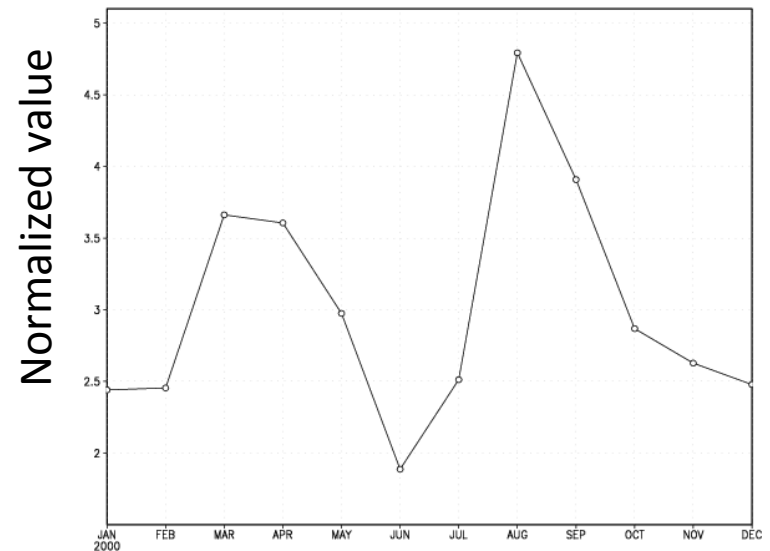
Standard deviation



Skewness (normalized)

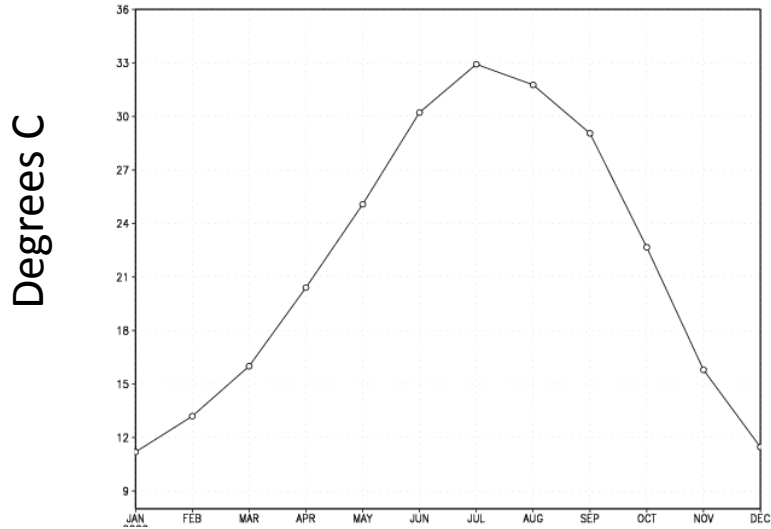


Kurtosis (normalized)

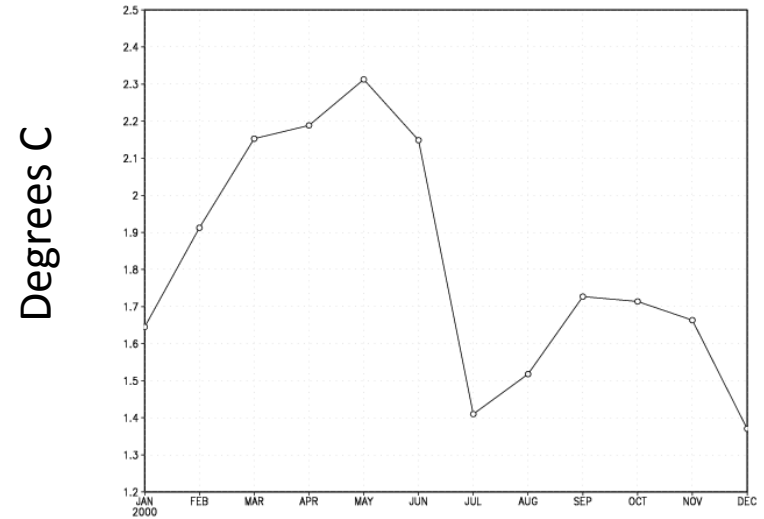


Station #2: Phoenix, AZ (Temperature)

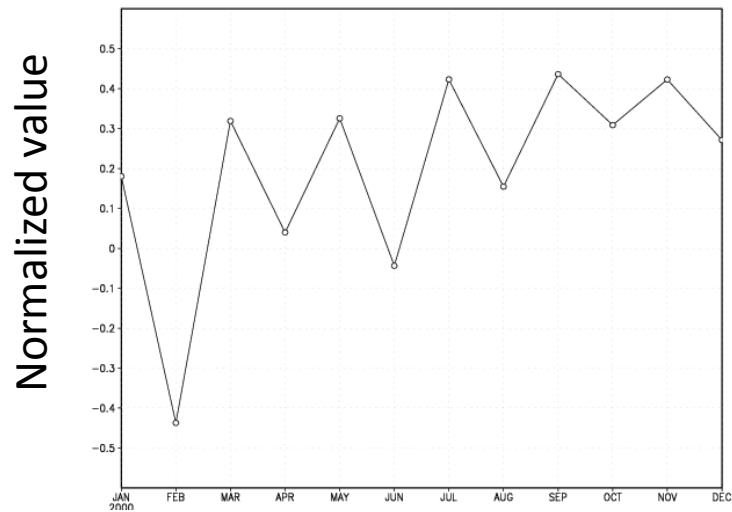
Mean



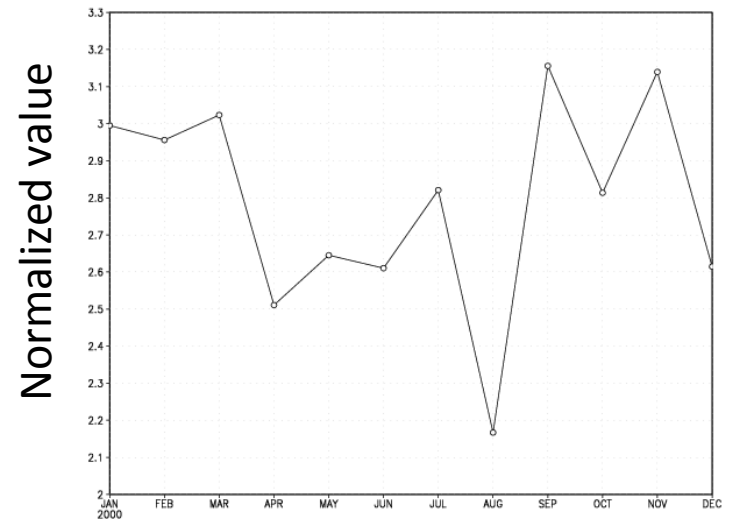
Standard deviation



Skewness (normalized)

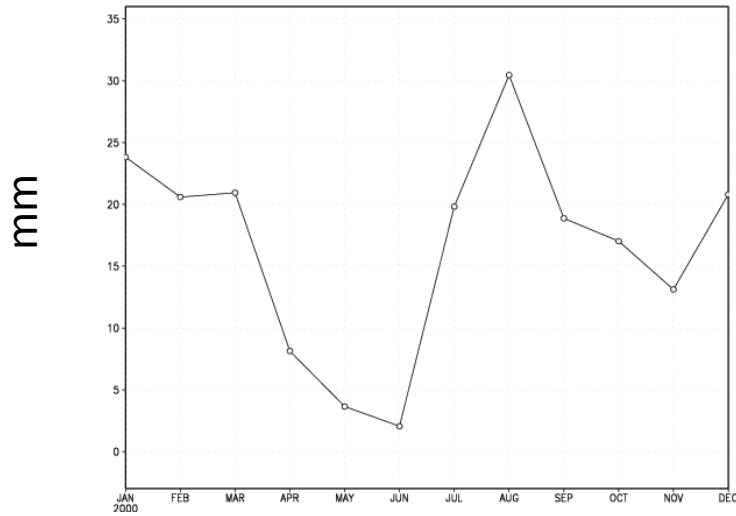


Kurtosis (normalized)

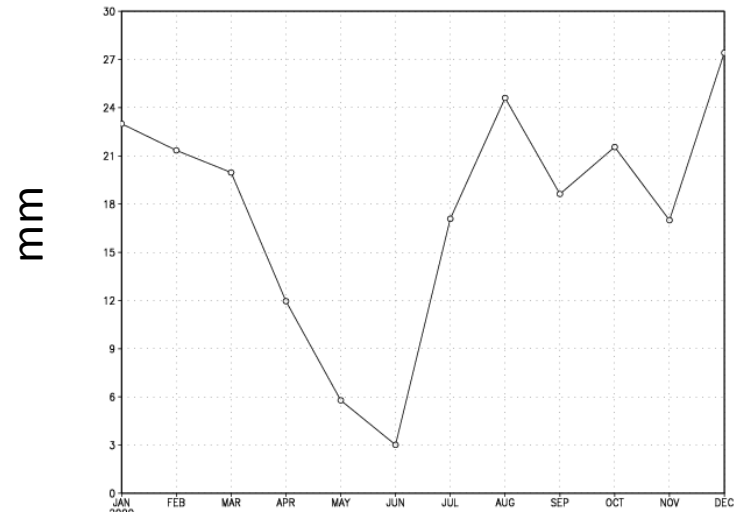


Station #2: Phoenix, AZ (Precipitation)

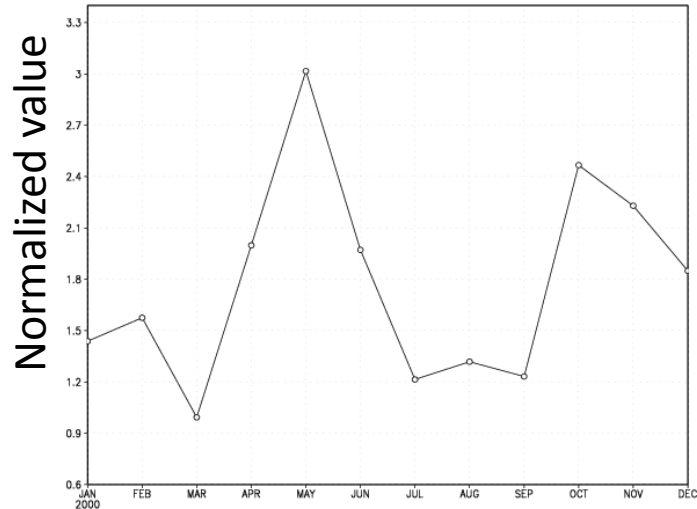
Mean



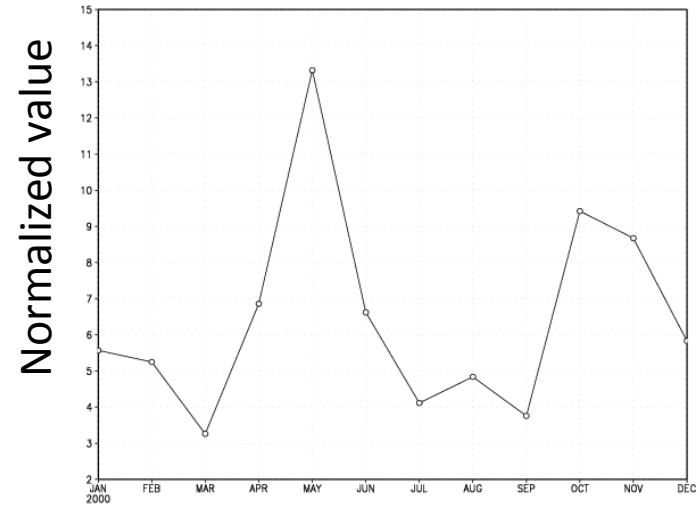
Standard deviation



Skewness (normalized)



Kurtosis (normalized)



Part 2: Seasonal Histograms, critical values for 1 in 25 year event using best fitting distribution

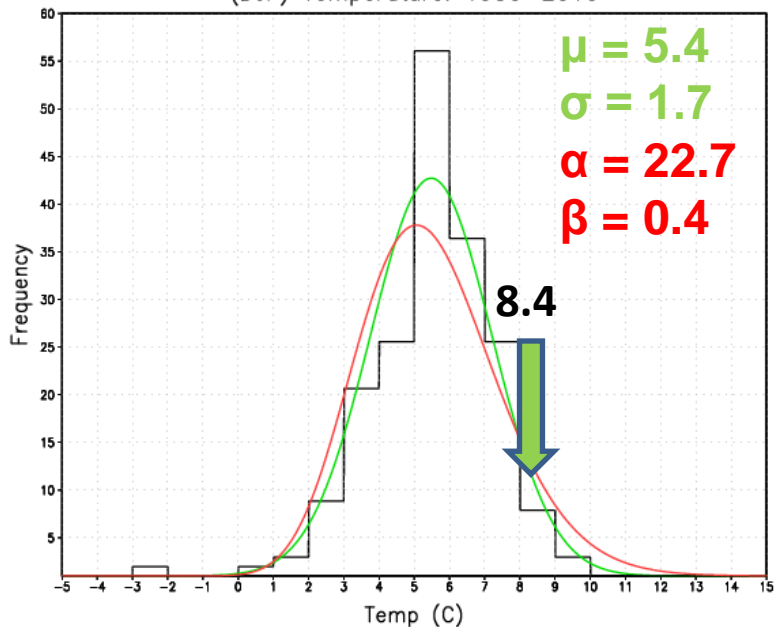
Histogram: black

Gaussian: green

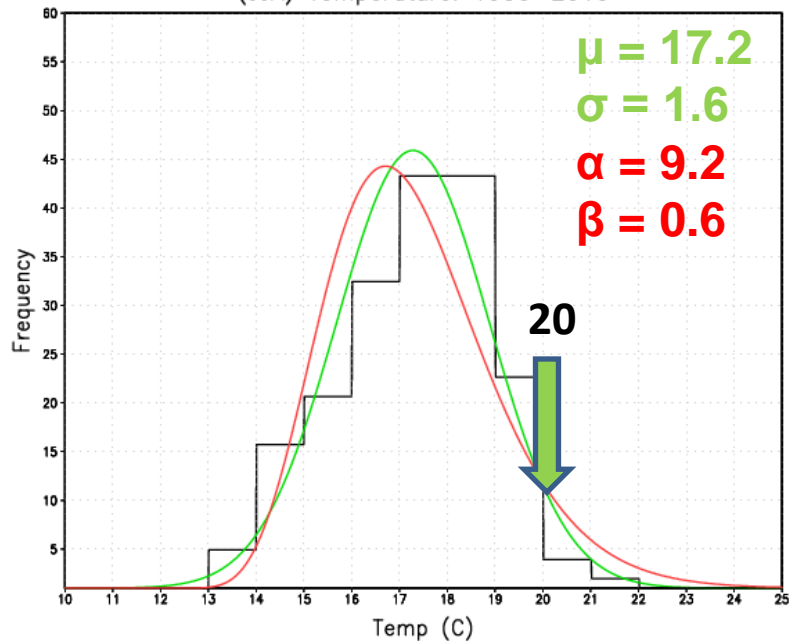
Gamma: red

20 points

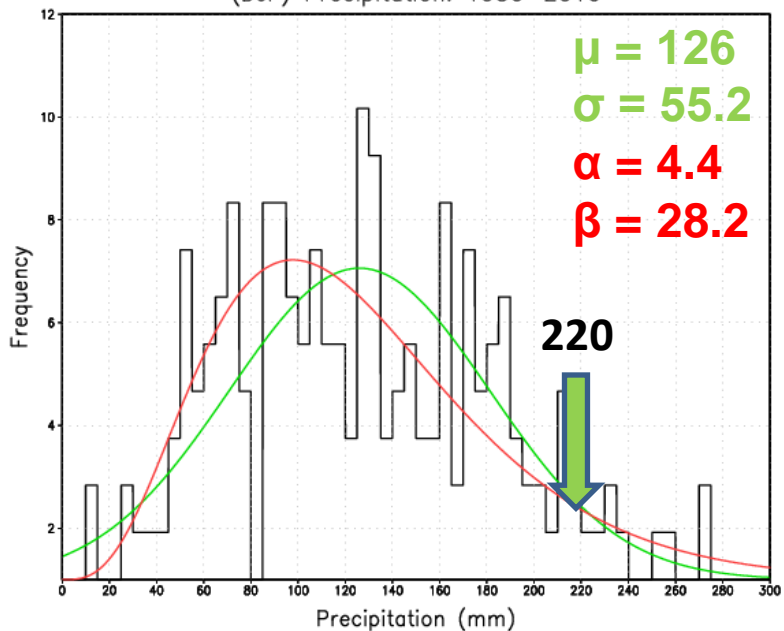
Station #2: Seattle Winter Average (DJF) Temperature: 1950–2010



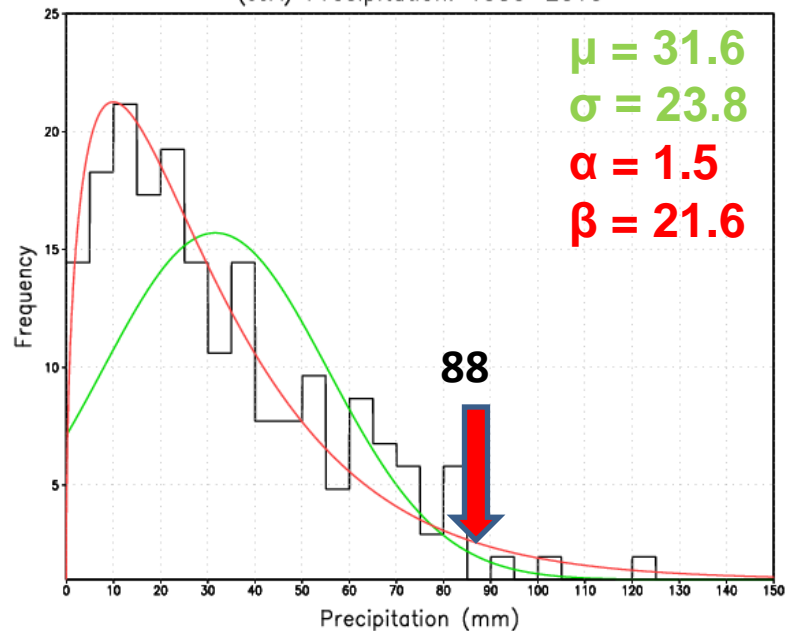
Station #1: Seattle Summer Average (JJA) Temperature: 1950–2010



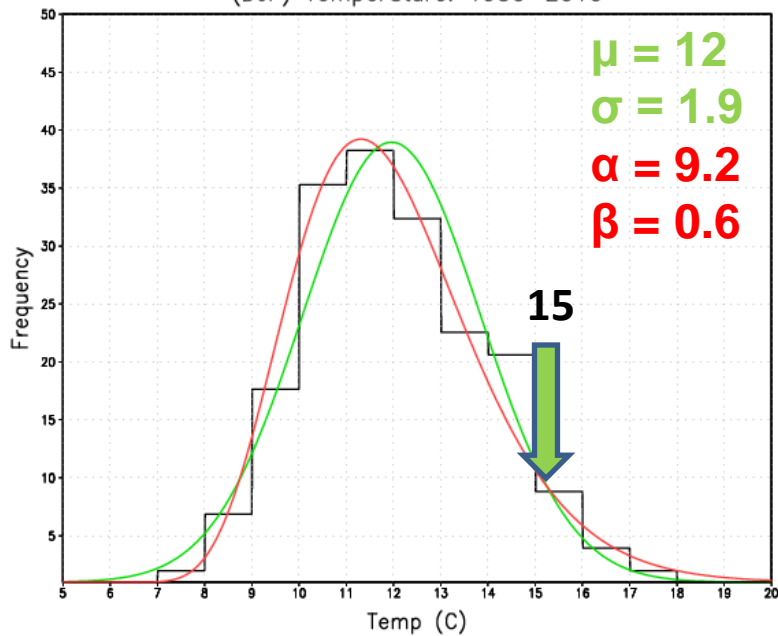
Station #1: Seattle Winter (DJF) Precipitation: 1950–2010



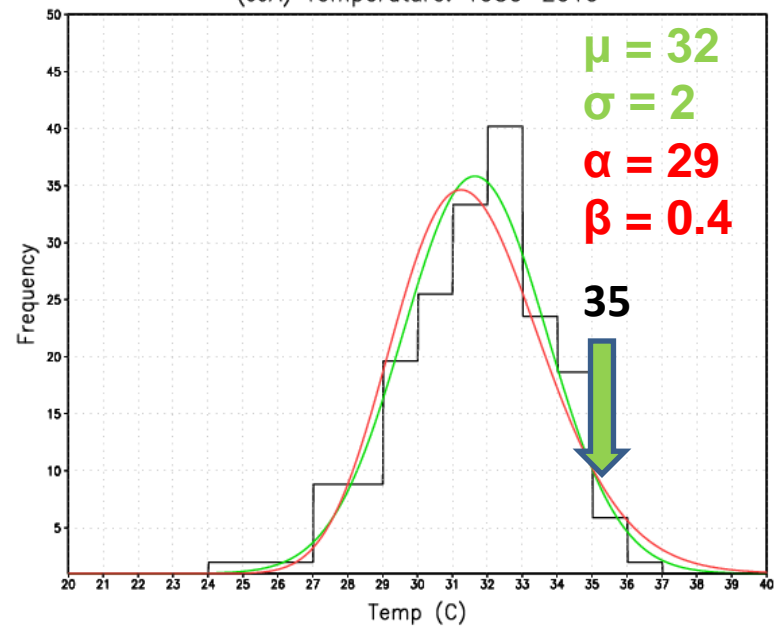
Station #1: Seattle Summer (JJA) Precipitation: 1950–2010



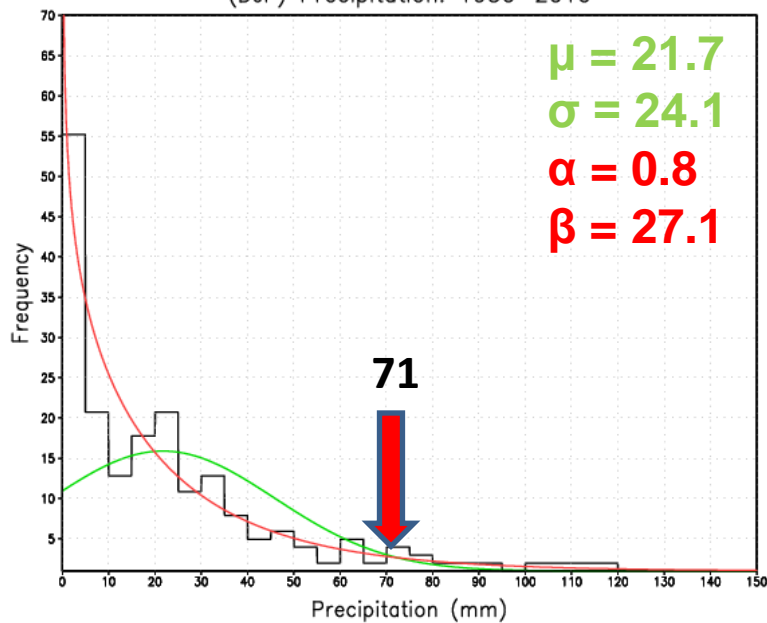
Station #2: Phoenix Winter Average
(DJF) Temperature: 1950–2010



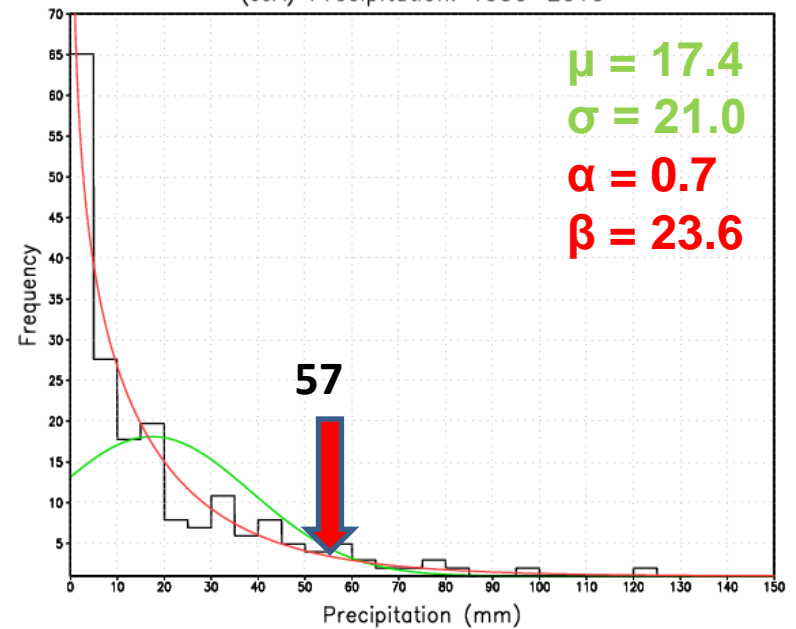
Station #2: Phoenix Summer Average
(JJA) Temperature: 1950–2010



Station #2: Phoenix Winter
(DJF) Precipitation: 1950–2010



Station #2: Phoenix Summer
(JJA) Precipitation: 1950–2010



Part 3: Goodness of fit tests
and one in 25 year events
20 points

Sample goodness of fit test results: Seattle, WA

H_0 Accepted, H_0 Rejected

(H_0 = Theoretical pdf fits histogram of observations)

Winter Temperature

X^2 (normal) = 1088

X^2 (gamma) = 3.23×10^8

**X^2 critical value 99% = 20.9
(8 DOF)**

Summer Temperature

X^2 (normal) = 10.85

X^2 (gamma) = 34.07

**X^2 critical value 99% = 16.8
(6 DOF)**

Winter Precipitation

X^2 (normal) = 58.7

X^2 (gamma) = 72.9

**X^2 critical value 99% = 66 (approx)
(43 DOF)**

Summer precipitation

X^2 (normal) = 141.37

X^2 (gamma) = 16.84

**X^2 critical value 99% = 33.4
(17 DOF)**

Sample goodness of fit test results: Phoenix, AZ

H_0 Accepted, H_0 Rejected

(H_0 = Theoretical pdf fits histogram of observations)

Winter Temperature

χ^2 (normal) = 6.68

χ^2 (gamma) = 5.20

χ^2 critical value 99% = 20
(8 DOF)

Summer Temperature

χ^2 (normal) = 19.42

χ^2 (gamma) = 225

χ^2 critical value 99% = 23.2
(10 DOF)

Winter Precipitation

χ^2 (normal) = 496.6

χ^2 (gamma) = 24.1

χ^2 critical value 99% = 37.5
(20 DOF)

Summer precipitation

χ^2 (normal) = 15597.1

χ^2 (gamma) = 22.8

χ^2 critical value 99% = 31.99
(16 DOF)

Extreme Events: Seattle, WA

Winter temp

Feb. 1958: 9.3
Feb. 1963: 9.1
Feb. 1968: 8.4
Feb. 1977: 8.5
Feb. 1983: 8.7
Feb. 1991: 8.8
Feb. 1992: 8.7

Summer temp

Jul. 1958: 21.0
Aug. 1967: 20.4
Aug. 1981: 20.4
July 1985: 20.3

Winter precip

Jan. 1953: 270
Dec. 1972: 233
Jan. 1974: 227
Dec. 1979: 225
Jan. 1986: 238
Jan. 1990: 224
Dec. 1996: 274
Jan. 2006: 252

Summer precip

Jun. 1964: 92
Aug. 1968: 95
Aug. 1977: 123

Extreme Events: Phoenix, AZ

Winter temp

Feb. 1954: 15.8
Feb. 1957: 15.5
Feb. 1991: 16.0
Feb. 1996: 16.0
Jan. 2000: 15.2
Feb. 2000: 17.7
Feb. 2006: 15.3
Feb. 2009: 15.3

Summer temp

Jul. 2000: 35.9
Jul. 2001: 35.7
Jul. 2003: 35.6
Jul. 2006: 35.2
Jul. 2009: 36.5
Jul. 2010: 35.6

Winter precip

Dec. 1959: 100
Dec. 1965: 113
Dec. 1967: 105
Dec. 1978: 75
Jan. 1979: 77
Dec. 1984: 88
Feb. 1987: 73
Jan. 1993: 115
Feb. 1998: 93
Feb. 2003: 72
Feb. 2005: 84
Jan. 2010: 71

Summer precip

Aug. 1951: 120
Jul. 1955: 76
Aug. 1955: 78
Aug. 1959: 62
Aug. 1963: 62
Aug. 1971: 81
Jul. 1984: 66
Aug. 1990: 96
Aug. 2008: 74